UNIVERSITY OF ALBERTA

NUMBER MARKING IN DAGBANI

BY

FUSHEINI HUDU

A THESIS SUBMITTED TO
THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF LINGUISTICS
EDMONTON, ALBERTA

FALL 2005

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To the two Alhajis (Sulemaṇa and Seidu)
and my old Prof. Alan Duthie

ABSTRACT

This is an account of number marking and nominal classification in Dagbani, a Gur language of Ghana, using the OT framework (Prince & Smolensky 1993). Singular and plural forms of nouns and adjectives have been accounted for through the interaction of four types of constraints: Faithfulness, Markedness, FIAT (MacBride 2004) and Anticorrespondence constraints (Hayes 1997).

Base-affixed form faithfulness constraints enforce correspondence relationship between stems and their output forms, Fiat-output faithfulness establish an output-output correspondence relationship between its requirements and output forms, while a number of anticorrespondence constraints are required, in patterns of suffixation that are not conditioned by the phonotactics of Dagbani, to map one suffix form onto another.

Unlike previous accounts which are limited to mainly regular number suffixation, the analysis captures all forms of number marking including suffixation, suppletion, zero number marking, as well as the use of reduplication to mark distributive plurality.

ACKNOWLEDGEMENTS

A lot of people deserve commendation for the diverse contribution they have made to the success of my academic life in the University of Alberta. But of course the first thanks goes to the almighty Allah, glory be to Him, the Exalted, with whose love, mercy, and infinite bounties I have successfully completed my studies. Certainly, my welfare, guidance, and success come only from Allah, in Him I put my trust, and unto Him I turn.

Then to Robert Kirchner, my supervisor. Your role as my supervisor in the early stages of my thesis can only be likened to that of a guide showing the way to a helpless chap wandering in the wilderness with little idea as to where to locate the road to his destination. I will never forget about your support for me since my arrival in Canada, and I will miss your phonology classes, especially your hand gestures in class which perfectly imitates various strictures between the tongue and palate, and various lenition processes.

I also thank my other thesis defence committee members: David Beck and Greg Kondrak. To David Beck, I owe a great deal of my scholarly growth in the University of Alberta to you, as each of the classes you taught me made me a different person. Many thanks for the helpful comments you made on my thesis draft. I also thank to all the friendly professors in the Linguistics Department including Sally Rice, Gary Libben, John Newman, and the rest, with whose company life in the department was always a fun.

To my friend Patrick Kukanu, thanks for giving me the idea of applying to the University of Alberta, and for your help, support and friendship even before I left for Canada, and during my 8 month stay with you, which always lit up memories of our life in JCR of Commonwealth Hall, University of Ghana.

I cannot forget of the numerous friends and brothers I have made in Canada, including my Indian brother Ansar Ahmad who was always available to here my complaints when I encountered difficulties in my thesis, Zakaria Al-Khatib, my wonderful brother who did all he could to make Canada a home for me. To Daniel Aboye, my colleague student in the department thanks for reading through my draft.

I have dedicated this thesis to three personalities: Alhaji Sulemana Meisuna, Alhaji Seidu Iddi, and Prof. Duthie. Although they are not in Canada, they continue to be a source of support to me, as they were when I was in Ghana. My word to them, as it has always been, is that of gratitude and appreciation.

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List of Abbreviation

Ø	zero morpheme
]	stem boundary
1	first person
2	second person
3	third person
Ak.	Akan
ANIM	animate
Ar.	Arabic
C	consonant
Eng.	English
Hau.	Hausa
INANIM	inanimate
irreg.	irregular
N	nasal
NOMN	nominal (particle)
PL	plural
RED	reduplicant
reg.	regular
SG	singular
suff.	suffix
V	vowel

CHAPTER 1. INTRODUCTION

1.0 What the thesis is about

This thesis describes the morphology and phonology of number marking in Dagbani, and provides an analysis thereof in terms of Hayes' (1997) and Mac Bride's (2004) Optimality-Theoretic approach to morphology. Unlike previous accounts, this study goes beyond number marking by suffixation, addressing suppletive number marking and the use of reduplication to mark distributive plurality. Also unlike previous approaches, nouns are not assigned to arbitrary classes for purposes of number marking; rather, I argue that the form of number marking which a given noun takes is, to some extent, predictable from the phonological shape of the stem.

I have used my native speaker intuitions as the main source of data for the thesis. This means the data reflects the dialect of Eastern speakers (see 1.2 below), which I personally speak, more than other dialects. But some examples also come from previous literature, which focussed on the Western Dialect.

1.1 Brief introduction to Dagbani

Dagbani is a Gur language of Ghana spoken by close to a million people. It is one of the major languages of the country, taught in schools and used in the state-owned media. Three distinct varieties of the language are spoken in *Dagbaŋ*, the traditional land of speakers of the language. These include the Western Dialect spoken in and around the administrative capital of Northern Region of Ghana, Tamale, the Eastern Dialect which is

spoken in Yendi, the traditional capital of *Dagbaŋ*, and Nanuni, the variety spoken by a different ethnic group called the Nanumba.

Dagbani is one of the least studied Gur languages although the language attracted the attention of linguists as early as any other language in the region. Other closely related Gur languages that have received relatively more attention in linguistic research include Dagaare (Bodomo 1997), Konni (Cahill 1992), and Gurune (Dakubu 1996). In the case of Dagbani, the most comprehensive account of the grammar is the PhD dissertation of Knut Olawsky (Olawsky 1999), in which aspects of the phonology, morphology, and syntax have been treated. Prior to it, the little research that has been done on the language, including Bendor-Samuel and Wilson (1965), Abu-Bakari (1977), Hyman (1988, 1993), Dakubu (1997) and Olawsky (1996) has focussed mainly on the phonology. However, because of the broad coverage of Olawsky (1999), some aspects of his analysis are sketchy, which calls for more research.

1.1.1 Segment inventory

Below, I present the sound inventory of Dagbani.

1.1.1.1 Consonants

Dagbani has 22 distinctive consonants including glides and doubly articulated sounds. These are shown in (1), with allophones in parenthesis.

(1) Dagbani consonant inventory.

	Labial		Alveolar		Post alveolar		Palatal		Velar		Labiovelar		Glottal
Plosive	p	b	t	d			tɕ	dʑ	k	g	kp	gb	(ʔ)
Nasal		m		n				ɲ		ŋ		ŋm	
Tap/Trill				(r/ɾ)									
Fricative	f	v	s	z	(ʃ)	(ʒ)							(h)
Lateral				l									
Glide		w (ʊ)						j					

A number of the consonants have been reported with slight variation in previous accounts. Wilson (1972) has the post alveolar [tʃ] and [dʒ] in place of the pre-palatals [tɕ] and [dʑ] respectively, differing from Olawsky (1996, 1999), who, like in the present analysis, has the latter. The glottal stop, which is a variant of /g/ in postvocalic position, has also been represented as [ɣ] in all the previous accounts, although Olawsky acknowledges the occurrence of /ʔ/ in some contexts. /w/ is also articulated as [ʊ] by many speakers of the Western Dialect.

The distribution of the other non-contrastive consonants are as follows: [ʃ] and [ʒ] are variants of /s/ and /z/ respectively before high vowels and [h] is a variant of /s/ before short vowels. Both [ɾ] and [r] are variants of /d/ with [ɾ] restricted to intervocalic position and [r] occurring in stem-final position of lexical items. In this thesis, I will generally use [r] in place of the two allophones.

1.1.1.2 Vowels

There are 11 vowel phonemes, comprising six short vowels, and five long ones. Allophonic variation (shown in parentheses below) is conditioned mainly by ATR vowel harmony rules.

(2) vowel inventory

Short vowels			Long vowels	
i	(ɨ)	u	i:	u:
(ɪ)		(ʊ)		
e		o	e:	o:
(ɛ)	ə	(ɔ)		
	a		a:	

The allophonic variations include /i/ ~ [ɨ] and [ɪ], /e/ ~ [ɛ], /u/ ~ [ʊ], and /o/ ~ [ɔ]. Of the allophones, the occurrence of [ɪ] and [ɨ] as separate sounds from /ə/ has not been agreed upon by all previous researchers. Unlike Wilson and Bendor-Samuel (1965) and Olawsky (1996, 1999), Dakubu (1997)'s account does not include [ə] in the sound inventory. She also dismisses the allophonic relationship between /u/ ~ [ʊ], and /i/ ~ [ɪ], but argues for alternation between [ɪ] and [ɨ]. The occurrence of [æ] as an allophone of [e] in the Western Dialect (corresponding to [ɛ] in the Eastern Dialect) has also been reported by Wilson and Bendor-Samuel (1965) and Dakubu (1997). In this thesis, only the schwa will be used in lieu of [ɪ] and [ɨ], as its occurrence and phonemic status are well motivated.

1.1.2 Tone

Dagbani is a tone language, with high (H), low (L), rising (LH), and falling (HL) tonal contrasts at the segmental and grammatical levels. Other tonal patterns include downdrift (a H tone at the end of a word or utterance being lower than preceding H tone in the word), and downstep H tone, which is generally morphophonemically predictable, and floating tone. Vowels are the main tone bearing units, but nasals also bear tone, especially when they occur as a homorganic infinitive prefix or person pronoun. Long vowels typically bear two tones.

1.2 Structure of the thesis

The thesis is organised as follows: In the next chapter, I introduce the data and present an exposition of nouns and adjectives along with a brief review of various aspects of previous account of nominal classification. The chapter concludes with a simplified view of various patterns of number suffixation in Dagbani.

In Chapter 3, I introduce Optimality Theory and how it is used in morphological analysis, especially in the treatment of allomorphy. Of particular interest are various mechanisms and constraint types such as correspondence theory, and FIAT constraints (Mac Bride 2004), as these are the main tools that will be used to account for the various patterns of number inflection in the rest of the thesis. In Chapter 4, the data is classified and each of the classes receives a detailed account, with the introduction of specific constraints and new constraint mechanisms. This is followed by the final discussion and conclusion in Chapter 5.

CHAPTER 2. THE DATA

2.0 Overview

This chapter presents the data on number marking in Dagbani. The subsections that follow contain a detailed description of the nominal stem, the number suffix, and the various patterns of number marking in the number marking of nouns and adjectives.

2.1 Dagbani nouns and adjectives

Dagbani nouns and adjectives mark number, either singular or plural. A typical noun and adjective in Dagbani consists of a stem and a number suffix. Regular number inflection involves a concatenative process of suffixing a variety of distinct allomorphs of the singular and plural morpheme to the stem. (3) and (4) below show examples of nouns and adjectives respectively.[1]

(3) Nouns

	Singular forms	Plural forms	
a.	<zoo> /zo-o/ [zo:]	<zohi> /zo-hi/ [zɔhə]	"housefly"
b.	<paga> /paʔ-a/ [paʔa]	<pagba> /paʔ-ba/ [paʔba]	"woman/wife"
c.	<yilgu> /jil-gu/ [jilgu]	<yilsi> /jil-si/ [jilsi]	"horn"
d.	<kɔbli> /kɔb-li/ [kɔblə]	<kɔba> /kɔb-a/ [kɔba]	"bone"
e.	<kɔbgu> /kɔb-gʊ/ [kɔbgu]	<kɔbri> /kɔb-ri/ [kɔbrə]	"hair"

[1] Throughout the thesis, I present the orthography in "< >" and the phonemic transcription of the stems and number suffixes in "//". The forms in "//" also show the underlying representation of the stems as they occur in larger morphosyntax (see 2.2 and (9) below for further discussion).

(4) Adjectives

	Singular form	plural form	
a.	<wogrili> /woʔrə-li/ [wɔʔrələ]	<wogra> /woʔrə-a/ [wɔʔra]	"huge"
b.	<golli> /gəl-li/ [gɔllə]	<gola> /gəl-a/ [gɔla]	"dangling"
c.	<chogiŋgu> /tɕoʔən-gu/ [tɕɔʔəŋgu]	<chogma> /tɕɔʔən-a/ [tɕɔʔma]	"weak"
d.	<jia> /dʑi-a/ [dʑja]	<jihi> /dʑi-hi/ [dʑihi]	"short"
e.	<woginli> /wogin-li/ [wɔʔənlə]	<wogla> /wɔginl-a/ [wɔʔla]	"tall"
f.	<bila> /bəl-a/ [bəla]	<bihi> /bi-a/ [bihi]	"small"

The category of nouns and adjectives being discussed here thus bear a number of similarities. As (3) and (4) show, these two categories are morphologically similar; i.e. they consist of a stem and number suffix. Syntactically, singular and plural forms of adjectives can be inflected for number, like nouns, when acting as predicates, (5).

(5)

a. i. [a ɲela bja]
2SG be child-SG
"You are a child."

ii. [ji ɲela bihi]
2PL be child-PL
"You are children."

b. i. [a ɲela woʔrə-lə]
2SG be huge- SG
"You are huge"

ii. [ji ɲela woʔr-a]
2PL be huge-PL.
"You guys are huge"

In (5b), the adjective "huge" inflects for number, just like "child" in 5(a). However, unlike the adjective [*woʔrələ*] in (5), other categories of adjectives show less resemblance to nouns, as they usually require a nominal particle *[zaʔ]* when they act as predicates, (6).

(6) Adjectives with nominal particles

a. i. [dɔ ɲela **zaʔ pʲel-lə]**
3INANIM be NOMN white-SG
"It is a white one"

ii. [dɔ ɲela **zaʔ pʲel-a]**
3INANIM be NOMN white-PL
"They are white ones"

b. i. [**m** mal **zaʔ pal-lə]**
1SG have NOMN new-SG
"I have a new one"

ii. [**m** mal **zaʔ pal-a]**
1SG have NOMN new-PL
"I have new ones"

c. ? i. [**m** mal **pal-lə]**
1SG have new-SG
"I have a new one"

? ii. [**m** mal **pal-a]**
1SG have new-PL
"I have new ones"

The next two subsections present a further exposition on the stem and the number suffix.

2.2 The stem

The stem is generally the more distinctive morpheme of nouns and adjective, and different stems may take the same number suffix, as in (4a and b). However, nouns and adjectives are not complete without a number suffix, making the latter an obligatory component of these words. In a few cases, the number suffix serves to disambiguate homophonous stems, as shown in the pairs in (7). With the exception of (7a), the rest of the examples in (7) are from Olawsky (1999: 79 - 80)

(7) Nouns and adjectives with homophonous stems.

	Singular forms	Plural forms	
a.	i. <kɔbili> /kɔb-li/ [kɔblə]	<kɔba> /kɔb-a/ [kɔba]	"bone"
	ii. <kɔbigu> /kɔb-gʊ/ [kɔbgu]	<kɔbri> /kɔb-ri/ [kɔbrə]	"hair"
b.	i. <cherili> /tɕɛr-li/ [tɕɛrə]	<chera> /tɕɛr-a/ [tɕɛra]	"driver ant"
	ii. <cheriga> /tɕɛr-ga/ [tɕɛrga]	<cherti> /tɕɛr-ti/ [tɕɛrtə]	"ladle"
c.	i. <salli> /sal-li/ [sallə]	<sala> /sal-a/ [sala]	"charcoal"
	ii. <saliga> /sal-ga/ [salga]	<salisi> /sal-si/ [salsi]	"weevil"
d.	i. <yuli> /ju-li/ [jʊlə]	<yuya> /ju-ja/ [juja]	"name"
	ii. <yua> /ju-a/ [jua]	<yuhi> /ju-hi/ [juhi]	"flute"

Parsing the stem and the number suffix of nouns and adjectives is not always easy to determine, since there is no syllable-morpheme-boundary alignment. This is very pronounced in nouns and adjectives with homophonous plural forms, but with different stems in the singular, as in (8).

(8)	Singular forms	Plural forms	
a.	< bia> /bi-a/ [bja]	<bihi> /bi-hi/ [bi.hi]	"child"
b.	<bila> /bəl-a/ [bə.a]	<bihi> /bi-hi/ [bi.hi]	"small"

The entire plural forms of the two examples in (8) are homophonous, but not the singular forms, as the stem in (8b) has a coda. Without comparing it to its plural form, however, it would not be obvious that /l/ in the singular of (8b) is part of the stem rather than the

suffix, i.e. ***[bə.-la],*** especially considering the widespread presence of nouns and adjectives with similar structure with *l* in stem-onset position that is dropped in the plural form (e.g. ***[gɔl.-lə]*** and ***[gɔ.l-a]*** "dangling").

A clearer diagnostic for determining the boundaries of the stem and number suffix is a larger morphosyntactic context in which a noun or adjective is followed by a modifier or other grammatical categories such as the indefinite morpheme *[so]* and the interrogative markers ***[ŋuni]*** "who (animate)" and ***[dənə]*** "which (inanimate)". In this context the number suffixes get dropped. A modified noun or adjective, for instance, has the structure "stem-modifier-number suffix" shown in (9).

(9) Noun + adjective (adjective + adjective) construction.

a. /bi-hi/ [bihi] + /kur-a/ [kʊ.ra] **->** [bi. kʊ.r-a]**.**
child-PL big-PL –> child-big-PL "big children"

b. /bəl-a/ [bə.la] **+** /kur-li/ [kʊr.lə] **->** [bəl. kʊr.-lə]
small-SG old-SG –> small old-SG "an old small one"

c. /so-li/ [sɔ.lə] **+** /wogən-lə/ [wɔ.ʔən.-lə] **->** [sɔ wɔ.ʔən.-lə]
path-SG long-SG –> path long -SG "long path"

The differing behaviour in this suffix-dropping context shows that the [l] in the adjective "small" belongs to the stem, whereas in the noun "path," it belongs to the suffix. The fact that uninflected forms of nouns and adjectives appear as separate words in noun + adjective and adjective + adjective constructions also provides evidence that number inflection takes place at the phrase level.

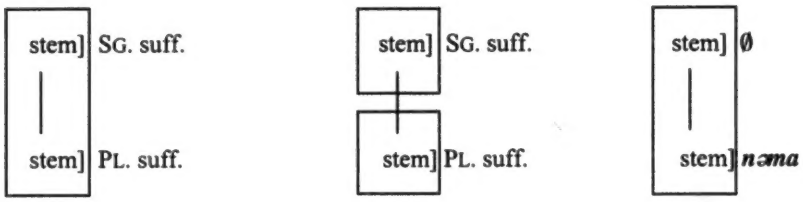
2.3 Number marking processes

The number suffix has been the main basis for classifying nouns in many languages with nominal classes, including Dagbani. Because of its central role in nominal classification, a discussion of number suffixes often involves establishing number classes.

Dagbani has three types of number suffixes (see also Abu-Bakari 1978, Olawsky 1999): regular singular and plural suffixes, irregular plural suffixes, and the default plural suffix. The suffixes shown above so far are examples of regular suffixes. They are suffix pairs that will generally replace each other in singular and plural suffixation, and that can be classified into one of the productive patterns in the language (noun classes). For instance, most stems with the ***–lə*** singular suffix take *–a* in plural forms. These two therefore form a pair by which speakers are able to predict the plural form of a novel noun or adjective with ***–lə*** as a singular suffix, and vice-versa.

Irregular singular and plural suffixes, on the other hand, are those that show exception to the productive patterns exhibited by nouns and adjectives in the language, making them difficult to be classified.[2] A common morphological process used to mark irregular plural in Dagbani is suppletion. (e.g. *[kpe:]* "colleague" to *[taba]* "colleagues"). The default plural suffix "*-nəma*" is so called because it is used for nouns and adjectives that are not marked for a distinct singular suffix in the singular forms. The majority of words in this category are loanwords borrowed mainly from English, Hausa, Akan, and Arabic (usually through Hausa). Figure 1 shows the different number suffixes and their relationship with the stem and inflected forms. (A similar representation is shown in Corbett (2000: 11 – 19) from which Figure 1 is adopted).

Figure 1. Different processes of number marking in Dagbani.



a. reg. suffix (SG. stem = PL. stem) b. irreg. (suppletion) c. default number suffixes (SG. = Ø, PL. = *nəma*.)

With the exception of Figure 1b, which marks plurality by suppletion, the sameness of the stem in singular and plural forms of nouns and adjectives is a common pattern in the other forms of number marking. But even in suppletion, the singular and plural forms still have stems and what look like number suffixes which are dropped in larger morphosyntactic contexts, as (10) shows.

(10) Suppletive nouns in larger morphosyntax.

a.	/kpe-e/	+	/ŋuni/	->	[kpe ŋuni].
	colleague	+	which.ANIM	->	"which colleague"
b.	/tab-a/	+	/ba-nəma/	->	[tab banəma]
	colleagues	+	which.ANIM-PL	->	"which colleagues"

2.4 Nominal classes

There are at least three different accounts of nominal classes in Dagbani (Benzing 1971; Wilson 1972, both cited in Olawsky 1999, and the account by Olawsky 1999 himself) that present a detailed classification of nouns and adjectives, although previous

[2] I differ in my use of the term "irregular" from previous researchers such as Olawsky (1999), who uses it to refer to a nominal whose morpohonology shows membership to a certain class, but shows some patterns

researchers such as Wilson and Bedor-Samuel (1965), Abu-Bakari (1978) and Hyman (1993) also touch on the subject. The main approach used in all these accounts is the morpho-phonological behaviour of the number suffixes, mainly the plural suffix. Thus, all nouns and adjectives in one class have the same plural suffix although they may have different singular suffixes. Interestingly all these accounts agree that the language has five nominal classes with sub-classes, in spite of disagreement on the exact nature of the nouns and adjectives that constitute each class. But these accounts do not treat the default plural suffix as a distinct class. Moreover, some nouns and adjectives show features of more than one class, leading to the existence of hybrid classes.

In (11) to (19), I present a more simplified classification devoid of subclasses but including suppletion and the default plural morpheme as part of my exposition of the data in this chapter. This gives nine patterns. The patterns are labelled using one or both number suffixes.

2.4.1 –di Pattern[3]

Nouns and adjectives have a unique *–di* plural suffix, and *–gu/–ga* suffix in the singular form.

---

that makes its singular or plural form a bit different from other nouns and adjectives in the class.

[3] The alternation between [ə] and [i], and that between [ʊ] and [u] in nouns and adjectives in this and other classes is due to the effect of ATR vowel harmony. In the analysis presented in Chapter 4, I assume an interaction between ATR vowel harmony constraints which will choose one between each pair, although the details will not be shown.

(11) Singular forms	Plural forms	
a) <mogu> /mɔ-gu/ [mɔʔu]	<mori> /mɔ-də/ [mɔrə]	"grass"
b) **<zugu>** /zug-gu/ [zuʔu]	**<zugri>** /zug-də/ [zuʔrə]	"head"
c) <begu> /be-gu/ [bʲɛʔu]	<beri> /be-di/ [bʲɛrə]	"ugly"
d) <kɔbgu> /kɔb-gu/ [kɔbgu]	<kɔbri> /kɔb-də/ [kɔbrə]	"body hair"
e) <zabgu> /zab-gu/ [zabgu]	<zabri> /zab-də/ [zabrə]	"hair on the head"
f) **<zɔŋ>** /zon-ga/ [zɔŋ]	**<zondi>** /zon-də/ [zondə]	"hall"
g) **<sɔŋ>** /son-ga/ [sɔŋ]	<sondi> /son-də/ [sondə]	"mat"

2.4.2 –gu/–ti Pattern

(12) Singular forms	Plural forms	
a) <gorgu> /gor-gu/ [gɔrgʊ]	<gorti> /gor-ti/ [gɔrtə]	"sickle"
b) <gbargu> /gbar-gu/ [gbargu]	<gbarti> /gbar-ti/ [gbartə]	"cripple"
c) <chergu> / tɕɛr-gʊ/ [tɕɛrgʊ]	<cherti> / tɕɛr-tə/ [tɕɛrtə]	"ladle"
d) <birgu> /bər-gu/ [bərgʊ]	<birti> /bər-tə/ [bərtə]	"dumb"
e) <kpargu> /kpar-gu/ [kpargʊ]	<kparti> /kpar-tə/ [kpartə]	"a kind of men's gown

2.4.3 –ga/–si Pattern

(13) Singular forms	Plural forms	
a. <zoŋa> /zɔn-ga/ [zɔŋ:]	<zonsi> /zon-si/ [zɔnsə]	"bat"
b. <wubga> /wub-ga/ [wubga]	<wubsi> /wub-si/ [wubsi]	"hawk"
c. <kpahga> /kpah-ga/ [kpahga]	<kpahsi> /kpah-si/ [kpah-sə]	"mat"
d. <yilga> /jil-ga/ [jilga]	<yilsi> /jil-si/ [jilsi]	"horn"
e. <gabga> /gab-ga/ [gabga]	<gabsi> /gab-si/ [gabsi]	"rope"

2.4.4 –hi Pattern

(14) Singular forms	Plural forms	
a. <bia> /bi-a/ [bja]	<bihi> /bi-si/ [bihi]	"child"
b. <noo> /no-o/ [no:]	<nohi> /no-si/ [nɔhə]	"chicken"
c. <nyee> /ɲe-e/ [ɲe:]	<nyehi> /ɲe-si/ [ɲehi]	"nose"
d. <nuu> /nu-u/ [nu:]	<nuhi> /nu-si/ [nuhi]	"hand"

2.4.5 –li/–ja Pattern

(15) Singular forms	Plural forms	
a. <puli> /pu-li/ [puli]	<puya> /pu-ja/ [puja]	"stomach"
b. <zoli> /zo-li/ [zoli]	<zoya> /zo-ja/ [zoja]	"mountain"
c. <shili> /ʃi-li/ [ʃili]	<shiya> /ʃi-ja/ [ʃija]	"preparation"
d. <toli> /to-li/ [toli]	<toya> /to-ja/ [toja]	"mortar"
e. <kuli> /ku-li/ [kuli]	<kuja> /ku-ja/ [kuja]	"hoe/funeral"

2.4.6 –a Pattern

(16) Singular forms Plural forms

a.	<wogrili> /wogri-li/ [wɔʔərlə]	<wogra> /wogri-a/ [wɔʔəra]	"huge"
b.	<golli> /gol-li/ [gɔllə]	<gola> /gɔl-a/ [gɔla]	"dangling"
c.	<pelli> /pel-li/ [pelli]	<pela> /pel-a/ [pela]	"white"
d.	<kɔbli> /kɔb-lə/ [kɔblə]	<kɔba > /kɔb-a/ [kɔba]	"bone"
e.	<kugli> /kug-li/ [kuʔli]	<kuga> /kug-a/ [kuʔa]	"stone"
f.	<bihli> /bih-li/ [bihli]	<biha> /bih-a/ [biha]	"breast"

2.4.7 –ba Pattern

(17) Singular forms Plural forms

a.	<doo> /do-o/ [do:]	<dobba> /do-ba/ [dobba /dabba]	"man"
b.	<paga> /pag-a/ [paʔa]	<pagba> /pag-ba/ [paʔba]	"woman"
c.	<zom> /zoon-Ø/ [zɔm]	<zoomba> /zoon-ba/ [zo:mba]	"blind"
d.	<dɔgim> /doʔrə-m/ [dɔʔəm]	<dogriba> /doʔrə-ba/ [dɔʔrəba]	"relative"

2.4.8 Default Pattern

(18) Singular forms Plural forms

a.	<ba> [ba]	<banima> [banəma]	"father"
b.	<ma> [ma]	<manima> [manəma]	"mother"
c.	<Abu> [abu] "Abu"	<Abunima> [abunəma]	"Abu and company"
d.	<torotoro> [torotoro]	<torotoronima> [torotoronəma]	"turkey"
e.	<yidana> /jidaana/ [jidana]	<yidaanima> [jida:n:əma]	"husband"

2.4.9 Suppletive pattern

(19) Singular forms Plural forms

a.	<kpee> /kpe-e/ [kpe:]	<taba> /tab-a/ [taba]	"colleague"
b.	<goli> /gɔl-ə/ [gɔlə]	<chira> / tɕir-a/ [tɕira]	"month"
c.	<kpaŋ> /kpaan-Ø/ [kpaŋ:]	<kpini> /kpaan-Ø/ [kpini]	"guinea fowl"
d.	<wohu> /wor–/ [wohu]	<yuri> /wor–/ [juri]	"horse"

2.5 Reduplication for distributivity.

Even though it does not constitute number marking, reduplication is used to mark distributive plurality. The language does display the process in an interesting way similar to some native languages of North America. For instance, Mithun (1988) has reported partial reduplication of nouns and verbs as a means of plural formation in Nass Tsimshian, Southern Paiute, and Maidu. In all these languages, reduplicated nouns and verbs function as distributives, "emphasising temporal, locative or conceptual distribution" (Mithun 1988: 220). Reduplication of adjectives has also been observed in Nass Tsimshian adjective by which "the qualities they specify are distributed individually over each item described" (Mithun 1988: 220).

In Dagbani, reduplication is used for two different nominal categories, in ways very similar to those exhibited in the languages cited above. Some non-derived nouns are reduplicated to show plurality that is distributed in different places (20a), to different participants (20b), at different times (20c), or a combination of all these, (20d). (The reduplicants are underlined)

(20) Singular forms Distributive forms

a. <tobu> [tɔbu] <tobtobu> [tɔbtɔbʊ] "wars (every where/ all the time)"

b. <jerlim> [dʒɛrləm] <jerlimjerlim> [dʒɛrləmdʒɛrləm] "foolishness (exhibited by different people)"

c. <chergu> [tɕɛrgu] <cherguchergu> [tɕɛrgʊtɕɛrgʊ] "bits (given at different times)"

d. <bela> [bɛla] <belabela> [bɛlabɛla] "small quantities"

Some derived nouns, on the other hand, are reduplicated for plurality probably because their derivational designation has made them somehow too complex to be inflected for a plural suffix, not even the "default" *-næma*. Derivation of these nouns, unlike other nouns in the language, only produce singular forms with no covert singular morphemes. So plural marking cannot be achieved in the regular process of suffixation except by other morphological means, which is reduplication.

(21) Singular forms Distributive forms Source verb

a. <pirli> [pərlə] <pirlipirli> [pərləpərlə] "dividend <pirigi> "divide"

b. <tarli> [tarlə] <tarlitarli> [tarlətarlə] "share/portion" <tari> "share"

c. <chandi> [tɕandə] <chandichandi> [tɕandətɕandə] "movement" <chaŋ> move"

d. <piibu> [pi:bu] <piibupiibu> [pi:bupi:bu] "elections" <pii> "choose"

The pattern involved here is total reduplication of the stem portion of the base. This explains the apocope of the final vowel in (20a), which has a base with a CVCV

structure, with the initial CVC being the stem. The difference between (20a) and the rest of the data is similar to the difference between the regular suffixation of plural morphemes and suffixation of the default ***–nəma*** suffix. In (20a), the final vowel is, like regular singular suffixes, dispensable when the noun is modified, as in *[tɔb kurlə]* "old war". By contrast, the other examples are like the word *torotoro* "turkey", as their final vowels are not apocopised when they are modified (e.g. *[pi:bu ma:]* "the choice" and *[bela ŋo]* "this small".

CHAPTER 3. OPTIMALITY THEORY IN MORPHOLOGICAL ANALYSIS

3.0 Overview

In 3.1, a brief introduction of optimality theory is presented. This is followed by 3.2 in which major constraint categories of OT are discussed. Important theories discussed include the theories of correspondence and the FIAT constraint family.

3.1. The OT approach

Optimality Theory (Prince and Smolensky 1993,) is an approach in which various aspects of the grammar of language are expressed as violable constraints, and the entire grammar of a language is viewed as a unique constraint ranking. Possible output forms of an input are assessed based on a universal language-specific constraint ranking. For any input form, output forms are generated by a device known as GEN, and the harmonic relationship between the two forms is assessed based on the constraint ranking. The most optimal output form is the one with no (or least) violation of highly ranked constraint(s). I illustrate with an analysis of palatalisation of consonants in the Eastern (and probably Western) dialect of Dagbani.

(22) Palatalisation of consonants before front ATR vowel

Input: /ŋme/	IDENT VOWEL (HIGH, FRONT)	PALATALISE	IDENT CONSONANT (FRONT)
a. ŋmo	*!		
b. ŋme		*!	
☞ c. ŋmʲe			*

(22a) is not optimal because it violates highest-ranked faithfulness constraint, IDENT VOWEL (HIGH, FRONT), which requires that the height and frontness of the vowel in the output exactly matches that of the input form.[4] (22b) satisfies this constraint by being an exact copy of the input form. But it violates higher-ranked "PALATALISE," a markedness constraint which demands that consonants in the output form preceding front vowels be palatalised. The most optimal output form thus is (22c), the output form which has only violated low-ranked IDENT CONSONANT (FRONT) constraint (by its failure to maintain the input specification for the feature "front").

The above process can be contrasted with the Nanuni Dialect, in which no such process takes place. The failure of consonants in this dialect to palatalise is attributable to a switch in the ranking of PALATALISE and IDENT CONSONANT (FRONT). Thus difference in constraint rankings between the two dialects is used to account for the different phonological patterns.

McCarthy (2001) has identified two unique aspects of the OT approach that make the theory more suitable for the treatment of allomorphy. These are the PARALLEL and GLOBAL nature of the OT grammar. Parallelism refers to the exclusive nature of GEN to construct fully formed candidates that differ in many ways from the input, which, by contrast, would have required several derivational steps in serial rule-based approaches. The grammar is also global in the sense that a device known as EVAL (evaluator) has the power to apply one language-specific constraint hierarchy to every candidate set from the input, in sharp contrast with the local application of rules in derivational theories. These two features of OT give the approach an advantage in handling derivational remoteness in allomorphy, where different output forms (of morphemes) actively compete as optimal

[4] See 3.3.1 and 3.3.2 for details on faithfulness constraints and other constraint categories.

forms, and where morpheme alternation could be unpredictable. While they can easily be captured in OT constraint ranking, they are very difficult to express in rule-based account, (see McCarthy 2001: 138ff for more detailed discussion).

3.2. Major constraint categories in OT

Two major constraint categories that have been widely used in the grammar of OT, and that are central to the discussion in the next chapter are FAITHFULNESS and MARKEDNESS constraints. Faithfulness constraints enforce a strict identity between input and output forms and therefore militate against structural changes in output forms. For instance, in Dagbani number marking, the height and roundness specification of the vowel in the base must be preserved in the affixed form. This, in OT grammar, is attributable to the effect of a faithfulness constraint banning any change in these features in output forms.

Markedness constraints, on the other hand require that output forms meet certain structural configurations, without any reference to the input forms, making them potentially antagonistic to faithfulness constraints. The general dispreference in many languages including Dagbani for coda obstruents and vowels in hiatus are examples of phonotactic configurations that can be respectively expressed by means of markedness constraints such as "No Coda" (no consonant is allowed in coda position) and "Onset" (a syllable must have a consonant in onset position). Interaction between these two constraint categories is required to achieve a balance between systematic change in the structures permitted by language and the preservation of the distinctions made by input forms.

An important theory used in evaluating the relationship between input and output forms is CORRESPONDENCE THEORY.

3.3. Correspondence theory

Correspondence Theory began as a theory describing the faithfulness between the base and a reduplicant (see MacCarthy and Prince 1994a, 1995). But it has since been extended to cover input-output faithfulness in features such as moras, syllables, feet, heads of feet, as well as tones and distinctive features and feature nodes (McCarthy 1995), cyclic and truncatory phenomena (Benua 1995, 1997), circumscriptional phenomena (McCarthy 2000) and relations between separate words (Benua 1995, 1997, Burzio 1996, Kenstowicz 1996, 1997, Kager 1996, Selkirk 1999). Some of the common correspondence constraints widely used are shown in (23), (see McCarthy & Prince 1994b, 1995, McCarthy 1995 and others for more details).

(23) Correspondence constraints

a. MAXIMALITY (MAX): "Every element of the input has a correspondent in output (No deletion)."

b. DEPENDENCE (DEP): "Every element of the output has a correspondent in the input (No insertion)."

c. LINEARITY: "The precedence structure of elements in the output forms must be consistent with those in the input form, (No metathesis)"

d. UNIFORMITY: "No segment in the output corresponds to more than one segment in the input. (No coalescence)."

e. IDENT(Feature) Correspondent segments in input and output forms have identical values for the feature F.

3.3.1 Faithfulness constraints

Four kinds of faithfulness constraints will be distinguished here: faithfulness of the affixed form to the base (FAITHBA), faithfulness of the output form to the input (FAITHIO) (which includes derived form inputs), and Faithfulness between the base and reduplicant (FAITHBR). The fourth one, FIAT-Output (FO) faithfulness constraint will be discussed in 3.3.3. The rest are further explained below.

3.3.1.1 FAITHBA

Base-Affixed form faithfulness constraints show correspondence between the stem portion of the base and that of the affixed form. Since nominal inflection is at the phrase level, a number suffix (e.g. singular) is needed before another inflected form can be projected (e.g. plural). However, in projecting plural forms from singular form, there is no impetus to preserve elements of the singular suffix which may be part of the base.

The base form may also be different from the input from which output forms are derived, a correspondence relationship expressed here as FaithIO, discussed below.

3.3.1.2 FAITHIO

Input-output faithfulness is the most common faithfulness correspondence in OT. An input type that is crucial to discussion in this thesis is one that is derived from the base which Mac Bride (2004) refers to as "derived form input." Mac Bride uses the term to

describe a kind of input-output faithfulness correspondence that captures "lexical exceptions to general morphological patterns" (Mac Bride 2004: 67) listed in the lexicon. This type of input differs from other inputs in that it is not universal to the grammar of the language, but applies only to restricted syntactic situations. Mac Bride uses the English plural noun *oxen* as an example of a derived form input which emerges when the noun *ox* is invoked with the syntactic property PLURAL, an exception to the regular process of plural formation in English.

In this thesis, derived form input will be essential for projecting inflected output stems that undergo slight structural change from what they are in larger morphosyntactic context. An example is shown in the change in the coronal place of the stem-final nasal of the noun */zələn-lə/* "tongue" */zəlm-a/* "tongues." In this instance, the stem *zəlm-* is an input derived from *zələn-* preserved in plural form by FAITHIO constraints. (See 4.1.4.2 and the tableau in (48) and (49) for details). In cases like this, output forms will be assessed using both FAITHIO and FAITHBA, with faithfulness to the latter (FAITHBA) being lower ranked. In Chapter 4, I will generally avoid FAITHIO constraints except where there is a derived form input.

3.3.1.3 FAITHBR

Base-reduplicant faithfulness is used in reduplication to control the size of the reduplicant and determine the amount of resemblance it bears with the base. A constraint such as MAXBR, for instance, enforces strict preservation of base features in the reduplicant. An undominated FAITHBR constraint could therefore result in total reduplication of the base and preservation of all base features such as stress, tone, and prosodic features.

Since affixed forms generally preserve all segments and segmental features of the base and input, blocking any deletion, insertion or change in their features, MAX, DEP and IDENT(F) and all the other correspondence constraints shown in (23) are generally undominated in all the classes. In the rest of the thesis, except where it is necessary to spell out the various faithfulness constraints, these correspondence constraints will be expressed as a cluster in the FAITHBA, FAITHIO, FAITHBR, and FAITHFO constraints.

3.3.2 Markedness constraints

Number inflection in Dagbani is one means by which the avoidance of consonant cluster and vowel hiatus is clearly manifested. This phonotactic generalisation can be expressed respectively as two constraints: NO CC or *CC, bans tautosyllabic obstruent cluster, and *VV forbids two vowels in hiatus (but not violated by long vowels). These constraints are undominated in all the classes.

The debuccalisation of [s] in intervocalic position and **[g]** in both intervocalic and postvocalic positions (see 4.1.1.1 for a discussion of these processes and how they affect the realisation of number suffixes) are other examples of markedness constraints. Ranking an ad hoc constraint such as *g/V__ (a vowel-g sequence is prohibited) over faithfulness constraints such as IDENTIO(dors) (input specification for the feature dorsal must be preserved in corresponding output forms) and IDENTIO (all features of input segments must be preserved in output segments) will lead to g debuccalisation, as shown in (24).

(24)

Input: zug-gu	*g/V__	IDENTIO(dors)	IDENTIO
☞ zuʔ-u		*	*
zug-gu	*!		

In Chapter 4, more constraints will be introduced whose interaction with those in (24) shows how other potential candidates will be ruled out.

3.3.3. FIAT constraint family

A number of challenges to the various approaches adopted within the OT framework in dealing with allomorphy still remain. These approaches have not been able to satisfactorily account for widespread instances of lexical unpredictability in language resulting from exceptionality, irregularity, as well as competitions between different patterns that cannot be captured by well-formulated morphological rules. Mac Bride (2004: 9 – 10) elaborates on these exceptions in the following words:

> Individual forms may be exceptions to morphological generalisations, … Sets of forms may constitute patterned exceptions to a morphological generalisation, or exceptional generalisation … a morphological system may be portioned out into regular but incompatible patterns marking the same syntactic or semantic features, with the particular morphological territory to which an individual form belongs being an unpredictable, lexically specified property (Mac Bride 2004: 9 – 10).

To account for these irregularities, Mac Bride proposes a constraint family called FIAT CONSTRAINTS to describe a family of input- or base-faithfulness constraints that encode morphological generalisations as well as capture morphological exceptionality and irregularity. FIAT constraints demand faithfulness of output forms with regards to

phonological properties such as morphological boundaries, phonological structures (such as segments, autosegments, features, prosodic elements and others), and morpheme mappings. The schema of FIAT constraints is shown in (25).

(25) Schema of FIAT constraints (Mac Bride 2004: 12)

SYN:PHON: An output with syntactic property SYN displays the phonological property PHON.

The syntactic property could be any morphological unit such as number, tense, case, e.t.c.

Mac Bride makes a distinction between two types of FIAT constraints, FIAT-STRUC, and FIAT-MORPH constraints. FIAT-STRUC constraints make two demands: that output features contain certain morphological boundaries, and that these boundaries contain certain phonological structures. The phonological structure that is demanded is one that is not in the input and cannot be captured by an input-output faithfulness constraint. It is also one that does not reflect the entire grammar of the language, and thus cannot be captured by markedness constraints. A FIAT-STRUC constraint is satisfied only when there is an exact match between the output and the phonological structural requirement(s) of the constraint. For instance, the suffixation of the plural morpheme *–a* to the base of some nouns in Dagbani can be expressed with a FIAT-STRUC constraint such as the one in (26).

(26) PLURAL: $]_{stem}$a (A form bearing the syntactic feature PLURAL contains the segment [*a*] following a stem boundary).

For a FIAT-STRUC constraint like this, no output form satisfies it except one that has *–a* as plural morpheme suffixed to the stem. This *–a* must be a separate segment that is not in correspondence with any segment in the input or base. Using *[dam:], [$d_1a_2m_3$-a_4]* "alcohol-SG/PL", as an example, output forms such as $d_1a_2m_3$-i_4, d_1a_2-a_3 and $d_1a_2m_3$-m_4a_5 all violate the constraint in (26). While the vowel suffix in *dam-i* fails to meet the structural specification demanded by the FIAT constraint, that of *da-a* is in correspondence with the segment /m/ in the base. *dam-ma* also violates syntactic requirement of the constraint for having more segments than required by the constraint.

FIAT-MORPH constraint, on the other hand, makes demands for morphological boundaries, and does not by itself specify their phonological structure, except that through the requirement of correspondence, they trigger faithfulness constraints that enforce identity to the stem. Expressing the rule in (26) as a FIAT-MORPH constraint would yield (27).

(27) PLURAL: $]_{stem}$/*a*/ (A form bearing the syntactic feature PLURAL contains a correspondent of /*a*/ following a stem boundary).

Since FIAT-MORPH constraints do not make any stipulations regarding the phonological structure, the plural morpheme could be any segment from consonants to vowels of any varying structure, or even syllables, so long as it is not in correspondence with a segment in the base. Using the previous example, output forms such as *dam-i, dam-m* and *dam-ma* all incur no violation of this constraint.

Fiat constraints thus establish an output-output correspondence relationship between its requirements and output forms, referred to here as FIAT-output faithfulness (FAITHFO). These require faithfulness to number affixes mandated by the FIAT constraints.

FIAT constraints also derive their strength from other mechanisms such as the novelty requirements, discussed below.

3.3.3.1 Novelty

A FIAT constraint may demand that it's PHON be novel, a requirement which are of two kinds: a) enforcing novelty in the entire PHON of the constraint, and b) enforcing novelty with respect to only a specific feature or features that must differ between segments in correspondence to satisfy the novelty requirement. The first kind has two effects: a novel PHON must either

> "i). have no correspondent string in the base" or
>
> "ii). have a correspondent string in the base that is non-identical to the PHON with respect to some feature or features specified in the PHON". (Mac Bride 2004: 55. See detailed discussion in original).

This mechanism is necessary to handle instances that show antifaithfulness, where certain patterns are realised not as a result of the need to preserve faithfulness between segments in correspondence, but rather to trigger lack of identity between them, thus making it impossible for traditional faithfulness constraints to handle.

Voicing alternation in Luo is a typical case of antifaithfulness that can be handled with the mechanism of novelty. In this language, plural formation involves the reversal of

the [voice] specification of the consonant in stem-final position of the singular form. Thus the plural of *bat* "arm" is *bed-e*, while that of *luedo* "hand" is *luet-e*. Mac Bride uses the two constraints below to handle the pattern.

(28) SYN:[-voice]]$_{stem}$e: A word with property SYN contains the string [-voice]] $_{stem}$e

(29) SYN:[+voice]]$_{stem}$e: A word with property SYN contains the string [+voice]] $_{stem}$e

Each of the above constraints is satisfied only when the output contains a string [αvoice]$_i$] $_{stem}$e and the base contains a string [-αvoice]$_i$] $_{stem}$e.

In this thesis, novelty specification will be used to regulate the realisation of singular and plural suffixes that are in correspondence to ensure that a form that appears as singular suffix cannot be parsed as the plural suffix to the same stem to which the singular form was suffixed. In other words, for a singular noun such as */jil-ə/* "house" the realisation of the plural suffix in the corresponding plural must be structurally different from –ə, which is the singular suffix. All FIAT constraints on number suffixes are specified for this novelty.

3.3.4 Factorial typology

The interaction of FIAT constraints and other constraint families yield the following factorial typology (paraphrased from Mac Bride 2004):

(30) Factorial typology of interaction between FIAT and other OT constraints. (Where neither "," nor "»" is used to separate the constraint categories, the ranking can vary from one language to another to produce the same effect).

i) Markedness » FIAT: phonological and morphological features of input forms determine the presence of an affix. (See 4.1.6 for account of default singular and plural suffixes.)

ii) FAITHIO » FIAT: Words show exceptions to general morphological rules. (e.g. the Suppletive Class discussed in 4.1.7).

iii) FIAT_1 FIAT_2 … FIAT_n FAITHOO: Phonologically conditioned allomorphy. (e.g. the pattern of plural suffixation in the *–gu/–ga* Class discussed in 4.1.1 and the *–hi* Class in 4.1.2).

iv) FAITHIO FIAT: unpredictable and lexically conditioned allomorphy. (same reference as in ii)).

CHAPTER 4. NUMBER CLASSES: A NEW ACCOUNT

4.0 Overview

In this chapter, the data introduced in Chapter 2 are reclassified and analysed using the OT constraints introduced in Chapter 3 as well new constraints and constraint mechanisms that will be introduced. A number of grammatical processes that play a role in shaping the form of number suffixes will also be discussed.

The underlying assumption is that neither the singular nor the plural forms of nouns and adjectives serve as the base from which the other is derived. Native speakers' ability to identify the singular form of the noun when presented with the plural form is naturally the same as their ability to identify the plural from the singular. Therefore, a comprehensive account of number inflection should allow us the opportunity to predict the plural form from the singular, and vice versa.

4.1 Nominal classes

The classification presented in Chapter 2 has a major limitation: which is the use of a singular suffix in projecting the plural forms of nouns and adjectives, and vice versa. To some extent, this assumption is valid, considering that number suffixes do serve to disambiguate nominal stem, as the examples in (7) show. In other instances, number suffixes may be used to signal a slight change in the meaning of the stem, as the examples below show.

(31)	Singular forms	Plural forms	
a.	<ʒee> /ʒe-e/ [ʒe:]	<ʒehi> /ʒe-hi/ [ʒehi]	"red"
b.	<ʒegu> /ʒɛ-gu/ [ʒɛʔu]	<ʒɛri> /ʒɛ-rə/ [ʒɛrə]	"bright reddish"

However, the fact that two of the patterns shown in Chapter 2 *(–gu/–ti* Pattern and the *–di* Pattern) have different plural suffixes in spite of having the same singular suffix for most of the nouns and adjectives point to the need to consider the structure of the stem in the analysis of number allomorphy. They show some level of phonotactic conditioning in number suffixation, even though number inflection is not entirely phonologically driven. On the other hand, the pattern of plural suffixation in the *–ba* Class is conditioned by the semantic feature animacy (discussed into detail in 4.5), that is common to all the examples in this class. By incorporating these grammatical processes, the patterns presented in Chapter 2 can be reduced to seven classes, discussed below.

4.1.1 –gu/–ga Class

This class combines two of the patterns introduced in Chapter 2, the –gu/–ti pattern (32 a – c), and the –ga/–si pattern (32d –g).

(32)	Singular forms	Plural forms	
a.	<gorgu> /gor-gu/ [gɔrgʊ]	<gorti> /gor-ti/ [gɔrtə]	"sickle"
b.	<gbargu> /gbar-gu/ [gbargu]	<gbarti> /gbar-ti/ [gbartə]	"cripple"
c.	<chergu> /tɕɛr-gʊ/ [tɕɛrgʊ]	<cherti> /tɕɛr-tə/ [tɕɛrtə]	"ladle"
d.	<zoŋa> /zɔn-ga/ [zɔŋa]	<zonsi> /zon-si/ [zɔnsə]	"bat"
e.	<baŋkaŋ> /baŋkan-ga/ [baŋkaŋ:]	<baŋkaŋsi> /baŋkan-si/ [baŋkansi]	"tick"
f.	<wubga> /wub-ga/ [wubga]	<wubsi> /wub-si/ [wubsi]	"hawk"
g.	<kpahga> /kpah-ga/ [kpahga]	<kpahsi> /kpah-si/ [kpah-sə]	"mat"

4.1.1.1 Lenition

The differences observed in the forms of the plural suffixes in this class (*–si* and *–ti*), those in the *–di Class* (*–di, –ri*), (in 4.1.3 below), and the *–hi* allomorph in the *–hi Class* (4.1.2) are a result of a number of various degrees of lenition processes, understanding which is key to understanding the classification in each of the classes. One of them is the debuccalisation of [g] into [ʔ] in postvocalic position and that of [s] into [h] in intervocalic position. I show the relevant data in the *–di* and *–hi* classes in (33).

(33)	Singular forms	Plural forms	
a.	<mogu> /mɔ-gu/ [mɔʔu]	<mori> /mɔ-də/ [mɔrə]	"grass"
b.	<zugu> /zug-gu/ [zuʔu]	<zugri> /zug-də/ [zuʔrə]	"head"
c.	<begu> /be-gu/ [bʲɛʔu]	<beri> /be-di/ [bʲɛrə]	"bad"
d.	<zɔŋ> /zɔn-ga/ [zɔŋ]	<zondi> /zon-də/ [zondə]	"hall"
e.	<fɔŋ> /fɔn-ga/? [fɔŋ]	<fondi> /fon-di/ [fondə]	"neighbourhood"
f.	<sɔŋ> /sɔn-ga/ [sɔŋ:]	<sondi> /son-də/ [sondə]	"mat"
g.	<bia> /bi-a/ [bja]	<bihi> /bi-si/ [bihi]	"child"
h.	<noo> /no-o/ [no:]	<nohi> /no-si/ [nohi]	"chicken"
i.	<nuu> /nu-u/ [nu:]	<nuhi> /nu-si/ [nuhi]	"hand"
j.	<nyee> /ɲe-e/ [ɲʲe:]	<nyehi> /ɲe-si/ [ɲʲehi]	"nose"

Unlike the /s/ –> [h] /V__ rule which has been observed by most previous researchers on Dagbani, the effect of the debuccalisation of /g/ into [ʔ] in postvocalic position on number inflection has not been observed. Part of the problem, as noted in Chapter 1, is that previous accounts of Dagbani have [ɣ] in place of [ʔ] in the /g/ –> [ʔ]/ V__(V) rule. The examples in (33a to c) show an underlying /g/ in the singular suffix debuccalising into [ʔ] and further getting deleted entirely due to the effect of a vowel or [ʔ] in stem-final position. [g] also typically deletes (sometimes along with the following vowel) when preceded by a nasal, after triggering the assimilation of the nasal into dorsal place, and with the possibility of getting lengthened, as in (32d and e) and (33d –f).

4.1.1.2 OT account

The distribution of the plural suffix *–ti*, in the *–gu/–ga* Class is exclusive to stems with a final [r]. However, the fact that its distribution does not embody phonotactic generalisations seen elsewhere in the phonology of Dagbani means pure markedness constraints cannot be used to account for it, leaving allomorph-selecting FIAT constraints as the option. *–si* on the other hand occurs after a variety of sounds including nasals, [b] and [h]. With the much wider distribution of *–si*, the distribution of all the plural allomorphs (including that of the *–hi Class* in 4.1.2 below) can be expressed with the FIAT constraints in (34) to (36).

(34) PL:]si: (Plural morpheme is *si* following the stem).

(35) PL: r]ti: (Plural morpheme is *ti* following a base with final *r*).

(36) PL V]hi: (Plural suffix following a vowel is *hi*).

Since (34) is not sensitive to context, it would have to be outranked by (35) and (36). The interaction between these constraints yields the result in (37).

(37) Projecting plural forms from singular base.

Base: dʒan]ga Input: Ø	FAITHBA	PL V]hi	PL: r]ti	PL:]si
☞ a. dʒan]si				
b. dʒan]a				*!
c. dʒan]tə				*!
Base: gbar]gu Input: Ø				
☞ d. gbar]tə				*
e. gbar]sə			*!	
f. gba]tə	*!	*		*
g. gba]hi	*!			*

But the alternation between *–gu* and *–ga* is difficult to account for. As the data in (32) show, nouns with *–ti* plural suffix generally take *–gu* singular suffix, and those with *–si* have *–ga* as the singular suffix. If this pattern were entirely regular, it would have been enough to serve as the basis for splitting the class into two. But there are widespread instances where the two suffixes occur in free variation with various corresponding plural suffixes including *–si*, *–ti*, and *–ri*, as the pairs in (38) show.

(38) *–gu* and *–ga* in free variation.

	Singular forms	Plural forms	
a.	i. <chergu> /tɕɛr-gʊ/ [tɕɛrgʊ]	<cherti> /tɕɛr-tə/ [tɕɛrtə]	"ladle"
	ii. <cherga> / tɕɛr-ga/ [tɕɛrga]	<cherti> /tɕɛr-tə/ [tɕɛrtə]	"ladle"
b.	i. <bobga> /bɔb-ga/ [bɔbga]	<bobsi> /bɔb-sə/ [bɔbsə]	"headgear"
	ii. <bobgu> /bɔb-gu/ [bɔbgu]	<bobsi> /bɔb-sə/ [bɔbsə]	"headgear"
c.	i. <wobgu> /wɔb-gu/ [wɔbgu]	<wobsi> /wɔb-sə/ [wɔbsə]	"lame"
	ii. <wobga> /wɔb-ga/ [wɔbga]	<wobsi> /wɔb-sə/ [wɔbsə]	"lame"
d.	i. <wobgu> /wɔb-gu/ [wɔbgu]	<wobsi> /wɔb-rə/ [wɔbrə]	"elephant"
	ii. <wobga> /wɔb-ga/ [wɔbga]	<wobsi> /wɔb-sə/ [wɔbrə]	"elephant"

Beside, neither the velar stop nor the vowel that follows it seems to have any effect on the choice of the plural suffix, as the various lenition processes affecting these two sounds have no effect on the form of the plural suffix. A more obvious evidence for this comes from the nativised English loan */ʃikur-u/ [ʃikuru]* "school" in which the velar stop is not present neither in the underlying nor the phonetic representation of the base, but the plural form */ʃikur-ti/ [ʃəkur-tə]* has the same suffix as other nouns with stem coda [r]. Thus while the phonological conditioning observed in the form of the plural allomorphs in this class serves as a basis for considering all the forms in (32) as belonging to one class, the *–gu* and *–ga* variation does not seem to give enough motivation for a split into two classes.

4.1.2 –hi Class.

(39)	Singular forms	Plural forms	
a.	<bia> /bi-a/ [bja]	<bihi> /bi-si/ [bihi]	"child"
b.	<noo> /no-o/ [no:]	<nohi> /no-si/ [nohi]	"chicken"
c.	<nuu> /nu-u/ [nu:]	<nuhi> /nu-si/ [nuhi]	"hand"
d.	<nyee> /ɲe-e/ [ɲʲe:]	<nyehi> /ɲe-si/ [ɲʲehi]	"nose"
e.	<bua> /bu-a/ [bwa]	<buhi> /bu-si/ [buhi]	"goat"
f.	<baa> /ba-a/ [ba:]	<bahi> /ba-si/ [bahi]	"dog"
g.	<bee> /be-e/ [bʲe:]	<behi> /be-si/ [bʲehi]	"nose"

As noted under the discussion on lenition, *-hi* is the allomorph of the *-si* in postvocalic position. Using the three constraints introduced in (34) - (36) and the faithfulness constraints, this plural suffix can be accounted for as in (40).

(40) Projecting Singular from plural base.

Base: bi]a Input: ∅	FAITHBA	PL V]hi	PL: r]ti	PL:]si
☞ a. bi]hi				*
b. bi]tə		*!		*
c. bi]si		*!		
d. bin]si	*!			

But the form of the vowel singular suffix in this class is difficult to predict, as one can not determine which of the four vowels (/u/, /o/, /a/, and /e/) will occur in this position, simply by looking at the base. Projecting singular forms of nouns with plural *–hi* suffix

can thus be achieved only by having a derived form input that includes the specific vowel forming the singular suffix, (41).

(41) Projecting plural forms from singular base.

Base: no]si Input: no:	*VV	FAITHIO	FAITHBA
a. no]o	*!	*	*
☞ b. no:			*
d. no]li		*!	*

4.1.3 –di Class.

(42) Singular forms — Plural forms

a. <mogu> /mɔ-gu/ [mɔʔu] — <mori> /mɔ-də/ [mɔrə] "grass"

b. **<zugu> /zug-gu/ [zuʔu]** — **<zugri> /zug-də/ [zuʔrə]** "head"

c. <begu> /be-gu/ [bʲɛʔu] — <beri> /be-di/ [bʲɛrə] "ugly"

d. **<kɔbgu> /kɔb-gu/ [kɔbgu]** — **<kɔbri> /kɔb-də/ [kɔbrə]** "body hair"

e. <zabgu> /zab-gu/ [zabgu] — <zabri> /zab-də/ [zabrə] "hair (on the head)"

f. <duu> /du-u/ [du:] — <duri> /du-di/ [dʊrɪ] "room"

g. <puu> /pu-u/ [pu:] — <puri> /pu-di/ [pʊrɪ] "farm"

h. **<zɔŋ> /zɔn-ga/ [zɔŋ]** — **<zondi> /zon-də/ [zondə]** "hall"

i. **<fɔŋ> /fɔn-ga/? [fɔŋ]** — <fondi> /fon-di/ [fondə] "neighbourhood"

j. **<sɔŋ> /sɔn-ga/ [sɔŋ:]** — <sondi> /son-də/ [sondə] "mat"

Just like the *–gu/–ga* Class, the examples in the *–ri* Class have an underlying *–gu/–ga* singular suffix, with few exception such as (42f and g). But unlike the *–gu/–ga* Class, the

plural allomorphs *(–di* and *–ri*) are not easily predictable. As noted in Chapter 1, [d] has the rhotics [r] and [ɾ] as allophones. This limits its occurrence in onset position of the plural suffix to only postnasal position. But even that is also not an exclusive environment for it, as we find /s/ in the same position in nouns in the *–si* Class. This makes it statistically very few compared with the other plural suffixes.

The distribution of *–ri* is also not phonologically conditioned. It occurs after /b/, (42d and e) and after glottal sounds (42b). But it also occurs in intervocalic position, the phonological environment of [h]. Thus the *–di* Class consists of various unpredictable forms of number suffixes which cannot fit into any other class. Singular and plural forms of nouns and adjectives in this class have to be learned by speakers.

4.1.4 –a Class.

(43) Singular forms	Plural forms	
a. <kɔbli> /kɔb-lə/ [kɔblə]	<kɔba> /kɔb-a/ [kɔba]	"bone"
b. <kugli> /kug-li/ [kuʔli]	<kuga> /kug-a/ [kuʔa]	"stone"
c. <bihli> /bih-li/ [bihli]	<biha> /bih-a/ [biha]	"breast"
d. <shili> /ʃi-li/ [ʃili]	<shiya> /ʃi-a/ [ʃija]	"preparation"
e. <kuli> /ku-li/ [kuli]	<kuja> /ku-a/ [kuja]	"hoe/funeral"
f. <walli> /wal-lə/ [wallə]	<wala> /wal-a/ [wala]	"fruit"
g. <gɔlli> [gɔl-lə]	<gɔla> [gɔla]	"dangling one"
h. <yilli> /jil-li/ [jilli]	<yila> /jil-a/ [jila]	"song"
i. <gbini> /gbən-lə/ [gbənə]	<gbina> /gbən-a/ [gbəna]	"buttock"
j. <nyini> /ɲin-lə/ [ɲini]	<nyina> /ɲin-a/ [ɲina]	"tooth"
k. <yuuni> /juun-lə/ [ju:nə]	<yuma> /juun-a/ [juma]	"year"
l. <zilinli> /zəlɜ̄-lə/ [zəlɜ̄lə]	<zilma> /zələn-a/ [zəlma]	"tongue"
m. <kɔm> /ko-mə/? [kɔm:]	<kɔma> /kɔ-ma/ [kɔma]	"water"
n. <ʒim> /ʒi-mə/? [ʒim:]	<ʒima> /ʒim-a/ [ʒima]	"blood"

Nouns and adjectives in this class have *–a* plural suffix and *–li* as the singular suffix, with the exception of the last two examples in (43). These suffixes occur irrespective of the consonant that occurs in stem-final position, as (43a–c) show. But for coda-less stems, an epenthetic /j/ occurs between the final vowel and the plural suffix to break a VV hiatus,

(43d and e). A number of phonological processes that play a role in number suffixation in this class are discussed below.

4.1.4.1 [l] gemination and deletion

An interesting process of forming nouns and adjectives in this class involves a hetromorphemic gemination of /l/ in singular forms in nouns derived from verbs with the structure CVli. While /l/ is geminated to produce a singular form of the derived base, plural formation involves suffixation of *–a* to the derived base. Examples are shown in (43f–h) which are derived respectively from the verbs *woli,* "bear fruit," *goli* "dangle" and *jili* "sing."

But while /ll/ is geminated in singular forms derived from verbs; it is deleted in some nouns within the same subclass with stem final nasals, (43i–k). This process is one means of resolving a sequence of a nasal and a lateral which are both coronals (nl sequence), a process driven by the markedness constraint *nl. Another means of resolving this sequence involves deletion of the nasal after spreading its nasality onto the preceding vowel, as the singular form of (43l) shows. This means for the singular form in (43l) to be optimal, *nl has to be ranked above UNIFORMITY, the anti-coalescence constraint in (23d).

A third means of satisfying this markedness constraint is to change the coronal specification of the nasal, as in the plural form of (43l). But the fact that it only changes into [m] and not any other nasal cannot be accounted for using the interaction between *nl and UNIFORMITY alone. Besides, this change takes place even when there is no nl sequence in the underlying representation, (43k). Thus we would only have to consider

the phonetic form in (43k) (which would also include the shortening of the vowel) as a derived form which would serve as the input for projecting the plural form of this noun.

The same procedure would be required for analysing the nouns (43m and n). In these examples, the base in a noun-adjective compound is not the base for number suffixation, as both singular and plural forms show that the nasal is part of the stem to which the number suffixes are attached. But the underlying form of the singular suffix cannot be easily determined. What is certain is that, in the Eastern Dialect, these nouns take the structure CVN:. If the singular suffix has a schwa in its underlying representation, then this process would be regarded as nasal lengthening.

4.1.4.2 OT account

To account for the general pattern of suffixation in this class, we need two more FIAT constraints specific to this class to complement those already introduced so far. These are shown in (44) and (45).

(44) SG: C]lə (Singular suffix is *–lə* following a stem with a final consonant).

(45) PL:]a (Plural suffix is *–a* following the boundary of the stem or the base).

For most of the forms in this class with stem-final coda, what we need is an undominated FAITHBA and the relevant markedness constraints, to project singular and plural forms, as (46) and (47) show.

(46) Singular suffixation from plural form

Base: zələn]a Input: ∅	*VV	FAITHBA (OTHER)	*nl	SG: C]lə	UNIFORMITY BA
a. zələn]ə				*!	
☞ b. zəlɜ̃]lə					*
c. zələn]lə			*!		
d. zələ]lə		*!			
e. zəlɜ̃]ə	*!			*	*

(47) Plural suffixation from singular form

Base: kɔb]lə Input: ∅	*VV	FAITHBA	PL:]a
☞ a. kɔb]a			
b. kɔb]rə			*!
c. kɔ]a	*!	*	

In (46), the split of FAITHBA into UNIFORMITYBA and FAITHBA (OTHER) (all other base-affixed form faithfulness constraints beside UNIFORMITY) and the low ranking of the former are necessary to showing the preferred means by which nl sequence is avoided by the noun "tongue". The other means, deletion, will not yield the optimal candidate, as it either violates the higher ranked SG: C]lə (46a), or MAX (46d).

But these constraints will not be enough to account for other nouns and adjectives with derived form inputs for number suffixation. For these examples, an undominated FAITHIO and a least ranked FAITHBA are needed, as in (48) and (49).

(48) Plural suffixation from singular form

Base: zələn]lə Input: zəlm]PL	FAITHIO	PL:]a	FAITHBA
a. zələn]a	*!		
☞ b. zəlm]a			*
c. zəlm]sə		*	*!
Base: kɔ]m: Input: kɔm]PL			
☞ a. kɔm]a			*
b. kɔ]ma	*!	*	
c. kɔ]a	*!		

(49) Singular suffixation from Plural form

Base: kɔm]a Input: kɔm:	FAITHIO	SG: C]lə	FAITHBA
☞ a. kɔm:		*	*
b. kɔm]lə	*!		
c. kɔ]m	*!		*

4.1.4.3 Non–automatic alternation.

The last group of nouns and adjectives to account for in this class are those with coda-less stems, shown in (43d and c), and repeated below with more examples.

(50) Singular form — Plural forms

a. <shili> /ʃi-li/ [ʃili] — <shiya> /ʃi-a/ [ʃija] "preparation"

b. <zoli> /zo-li/ [zɔlə] — <zoya> /zo-a/ [zɔja] "hill/mountain"

c. <soli> /so-li/ [sɔlə] — <soya> /so-a/ [sɔja] "path"

d. <kuli> /ku-li/ [kuli] — <kuja> /ku-a/ [kuja] "hoe/funeral"

e. <beli> /be-li/ [bʲeli] — <beja> /be-a/ [bʲeja] "elder sibling of same the sex"

The examples in (50) require an epenthetic [j] in order to break a VV hiatus in plural forms because they do not have stem-final coda. This means an active undominated *VV. But this anti-hiatal constraint has no control over the feature of the sound that serves as the epenthetic segment. Especially in examples such as (50d), an epenthetic [w] would be functionally more optimal since it shares more phonetic features with the preceding vowel than [j], and would be articulatorily much easier. In other words, while the epenthesis observed here is driven by the phonology, the choice of [j] as the epenthetic sound is not, and markedness constraints cannot account for it. Hayes (1997) uses the term "non-automatic alternation" to describe phenomena such as this. I will discuss this further in 4.1.4.4 below. The weakness of the *VV and other constraints introduced so far is shown in (51), where there is no clear winning candidate for an input like [sɔlə] "path".

(51) No clear winning candidate for coda-less stems.

	Base: sɔ]lə Input: Ø	FAITHBA	*VV	PL:]a
	a. so]a		*!	
	b. soj]a	*!		
☞	c. so]ja			*
☞	d. so]wa			*

Another contrast between the examples in (50) and other forms in this class is that class-specific constraint SG: C]lə, which only assesses the singular suffixes of consonant final stems, can not assess optimal singular forms of (50), and any other singular suffix such as *–gu*, and *–ʔu*, could be parsed, so long as the base does not violate FAITHBA. This is illustrated in (52).

(52) All candidates could be optimal for coda-less stems.

	Base: ʃiljа Input: ∅	FAITHBA	SG: C]lə
☛	a. ʃiʔu		
☛	b. ʃilga		
☛	c. ʃilli		

The solution to this is the use of ANTICORRESPONDENCE constraints, discussed below.

4.1.4.4 Anticorrespondence.

The correspondence theory has a central aim: namely to define the relationship between input and output forms (or base and affixed forms) based largely on the phonotactic conditions. Correspondence constraints thus use the phonotactics to define what alternations are permissible in a language. However, there are instances where morphological alternations, like those in (50), are non-automatic, (Hayes 1997), in that they are not conditioned by the phonotactics of the language, and their non-occurrence does not constitute a violation of phonotactic conditions. This poses a challenge to correspondence constraints, which cannot account for the failure of regular morphological processes to occur. Hayes (1997) employs the term anticorrespondence as a device to handle this type of alternation. Anticorrespondence constraints basically require alternations between morphemes in a particular way by establishing mappings between them and the environments that condition them.

Hayes proposes this device to account for penultimate vowel shortening of absolutive stem in Yidiŋ, which occurs in a context that is not driven by phonotactic conditions. Hayes uses the constraint in (53) to account for this pattern (employing single slashes for context of the target segment within the base form from which the derived

form is being projected, and double slashes for contexts in which the alternating morpheme appears).

(53) Stem-penultimate shortening (Hayes 1997: 29).

V: / ___σ] // ___]$_{Absolutive}$ –> V // ___ σ

This is read as: "long vowels that appear in the penult of the absolutive stem must appear as short, when the stem appears before another syllable." (See Hayes 1997 for details on this alternation).

The mechanism employed by anticorrespondence constraints is what we need to account for number suffixation in the examples in (50). In order to rule out potential plural forms such as *[*zowa*] (in place of [*zoja*] "hills" and *[*sowa]* (in place of [*soja*] "paths," we need a constraint that will specify the features of the epenthetic segment, something that *VV could not do. Similarly, this constraint must have the power to rule out the non-optimal forms in (52) (*[ʃi]ʔu] and [*ʃi]ga]), by limiting the suffix onset consonant to [l], what the FIAT STRUC constraint SG: C]lə could not do. These requirements can be handled by the anticorrespondence constraints in (54) and (55).

(54) CV]li$_{SG}$ –> CV]ja$_{PL}$: A form with a singular suffix *–li* following a coda-less stem corresponds to another with a plural suffix *–ja* following the same stem.

(55) CV]ja$_{PL}$ –> CV]li$_{SG}$: A form with a plural suffix *–ja* following a coda-less stem corresponds to another with a singular suffix *–li* following the same.

These two constraints do not have to out rank other FIAT constraints before the optimal singular and plural forms can be projected, as shown in (56) and (57).

(56) Plural suffixation from singular form

Base: sɔ]lə Input: ∅	*VV	FAITHBA	CV]li$_{SG}$ –> CV]ja$_{PL}$	PL:]a
a. so]a	*!		*	
b. soj]a		*!		
☞ c. so]ja				*
d. so]wa			*	*!

(57) Projecting singular forms of coda-less stems with anticorrespondence constraints.

Base: ʃi]ja Input: ∅	FAITHBA	CV]ja$_{PL}$ –> CV]li$_{SG}$	SG: C]lə
a. ʃi]ʔu		*!	
b. ʃi]ga		*!	
☞ c. ʃi]li			
d. ʃil]ga	*!	*	*

If we incorporate these two constraints into the hierarchy of all the constraints used so far in this class, we will obtain the ranking in (58) for both singular and plural suffixation of nouns and adjectives without derived form inputs. (For those with derived form inputs FAITHIO will take the place of FAITHBA and the latter will be ranked lower).

(58) Constraint hierarchy for number suffixation in the –a Class.

a. Singular suffixation: FAITHBA(OTHER), MARKEDNESS CONSTRAINTS » SG: C]lə, UNIFORMITYBA, CV]ja$_{PL}$ –> CV]li$_{SG}$.

b. Plural suffixation: FAITHBA, MARKEDNESS CONSTRAINTS » PL:]a, CV]li$_{SG}$ –> CV]ja$_{PL}$

Since the requirement of the anticorrespondence constraints does not affect any noun or adjective except those that are coda-less, this hierarchy will correctly predict the optimal forms of all nouns and adjectives in this class, This shows that the optimal candidates in (56) and (57), in spite of being phonotactically different from other forms in this class, are part of the class. In other words the inclusion into the class has been motivated.

4.1.5 –ba (Animate) Class..

(59) Singular forms	Plural forms	
a. <doo> /do-o/ [do:]	<dobba> /do-ba/ [dobba /dabba]	"man"
b. <paga> /paʔ-a/ [paʔa]	<pagba> /paʔ-ba/ [paʔba]	"woman"
c. <sana> /saan-Ø/ [sana]	<saamba> /saan-ba/ [sa:mba]	"stranger"
d. <zom> /zoon-Ø/ [zɔm]	<zoomba> /zoon-ba/ [zo:mba]	"blind"
e. <dɔgim> /doʔrə-Ø/ [dɔʔəm]	<dogriba> /doʔrə-ba/ [dɔʔrəba]	"relative"

This class (with the plural suffix –ba) is the only one in which plural suffixation is determined by a semantic feature, animacy.

4.1.5.1 Animacy

The crosslinguistic uniqueness of animacy has been observed by a number of linguists. Comrie (1981) and others describe it as "an extra-linguistic conceptual property" that shows up as "distortions" or "emergent properties" in grammar, and that can be difficult to subject to formal categorisation. Bronson (1995) and Dery (1993) also characterise animacy as a "force" that often leads to expansion in complexity in ways that are

paradigmatically inconsistent with other aspects of the grammar of a language. These observations reflect the inflection of the nouns and adjectives in this class. As the examples show, there is no phonological environment (neither in the base nor the singular suffix) unique to the forms in this class that could be viewed as the trigger of *–ba* suffixation. Rather, some of the examples show, by the structure of the stems or singular suffixes or both, forms that would be expected to belong to different classes, if the phonological processes active in other classes were to be applied. For instance, (59a), would be expected to belong to *–ti* Class with ***–hi*** as the plural morpheme, compared with [*nu:*] and [*nuhə*] "hand" (39c); and (59b), to the –di Class, compared with *[zuʔu]* and [*zuʔrə*] "head", (42b), (although the patterns of number suffixation in this class itself is not phonologically driven).

4.1.5.2 OT account

Since the suffixation of animate plural morpheme *–ba* is not conditioned by the phonology and morphology of Dagbani, only anticorrespondence constraints can be used to capture the pattern. However, the singular suffixes are not predictable, so we would need a schema as in (60) and (61) from which constraints can be posited for individual nouns. In this schema, "X" is used to represent any sound in the base.

(60) Base: $X]_{stem}$ba.

Input: $X]_{stem}X]_{suff.}$

(61) Base: $X]_{stem}$ $X]_{suff}$.

Input: $X]_{stem}$ba.

Using (59c), singular and plural anticorrespondence constraints such as (62) and (63) could be posited:

(62) n]ba –> n]a : (A plural form with *n* in stem final position has a singular form with *n* in stem coda position followed by the suffix *–a*).

(63) n]a –> n]ba : (A singular form with *n* in stem final position has a plural form with *n* in stem coda position followed by the suffix *–ba*).

The interaction between each of these and the usual faithfulness constraints would yield (64) and (65).

(64) Singular suffixation from plural base

Base: sa:n]ba Input: san]SG	FAITHIO	N]ba –> n]a	FAITHBA
☛ a. san]a			*
b. sa:n]a	*!	*	
c. san]lə		*	*!

(65) Plural suffixation from singular base

Base: sa:n]a Input: Ø	FAITHBA	n]a –> n]ba
☞ a. sa:n]ba		
b. san]ba	*!	
c. sà:n]sə		*

4.1.6 Default (–nəma) Class.

(66) Singular forms Plural forms

a. <buku> [buku] <bukunima> [bukunəma] "book" (Eng.)

b. <moto> [moto] <motonima> [motonəma] "motor bike" (Eng.)

c. <peto> [peto] <petonima> [petonəma] "small pant" (Ak.)

d. <kur'aani> [kurʔa:ni] <kuraaninima> [kurʔa:ninəma] "Koran" (Ar.)

e. <yoroyoro> [jorojoro] <yoroyoronima> [jorojoronəma] "boiled corn meal"

f. <torotoro> [torotoro] <torotoronima> [torotoronəma] "turkey"

g. <Abu> [abu] "Abu" <Abunima> [abunəma] "Abu and company"

h. <ba> [ba] <banima> [banəma] "father"

i. <ma> [ma] <manima> [manəma] "mother"

j. <namdili> [namdələ] <namda> /namda/ <namdanima> [namdanəma]
"footwear-SG/PAIR/types of."

k. <simli> [simlə] <sima> [sima] <simanima> [simanəma]
"peanut-SG/PL/varieties or plantations of"

It has standardly been assumed that the suffix ***-nəma*** is a default plural morpheme, mainly for loanwords, because they have no identifiable suffix in their singular forms. The fact that most loanwords receive this plural suffix is indisputable, as (66a – d) show.

However, the rest of the examples in (66) (which are all native nouns) and other fully nativised loans (67) show that the inflection of *-nəma* as a plural suffix is more widespread than the loanword vocabulary. (66e and f) show a process of *-nəma* suffixation to nouns with a reduplicated structure, while (66g) shows the use of this suffix when using the name of one person to refer to a group the person belongs to. But (66h and i) shows other exception that cannot be easily explained. On the other hand, in (66j and k), ***-nəma*** is used to mark plurality of a different sense. It expresses plural form of nouns that show several types or varieties of what is being referred to. In this type of suffixation, ***-nəma*** is suffixed to a form that may already have the plural suffix.

(67) Loanwords taking regular number marking suffixes (all from English)

	Singular forms	Plural forms	
a.	<shikuru> /ʃikur-u/ [ʃikuru]	<shikurti> /ʃikur-tə/ [ʃikurtə]	"school"
b.	<kaa> /ka:-Ø/ [ka:]	<kahi> /ka:-hə/ [kahə]	"car"
c.	<poliŋga> /polin-ga/ [poliŋga]	<polinsi> /polin-si/[polinsi]	"police"
d.	<bolli> /bɔl-lə/ [bɔllə]	<bola> /bɔl-a/ [bɔla]	"(foot)ball"
e.	<soobuli> /so:bul-i/ [so:buli]	<soobuya> /so:bul-ja/ [so:buja]	"shovel"

But there is still one thing common between these native words and other loans that receive the suffix *-nəma*, which is the lack of an overt singular suffix in the base (the singular form) to which ***–nəma*** is suffixed, a feature which could be used to neutralise the distinction between loan and native words. The lack of an overt singular suffix means

that plurality in these loan and native words is not marked in the same way as it is done in other classes.

4.1.6.1 OT account

To account for the pattern of plural suffixation, we need the class-specific FIAT STRUC constraint in (68).

(68) PL:]nəma: Plural suffix following a word boundary is -nəma.

With this constraint, no other plural allomorph besides *--nəma* emerges as the optimal form.

As for the suffixation of the zero singular morpheme no other constraint is required, so long as the faithfulness and markedness constraints are satisfied. But as (71) shows, since this result comes at a cost of failure to overtly mark the noun with a singular morpheme, it incurs a mark of a constraint called MORPHREAL, (Gnanadesikan 1997) defined in (69):

(69) MORPHREAL: The number morpheme should be overtly and detectably marked.

(70) Plural derivation

Base: sima]Ø	FAITHBA	MARKEDNESS CONSTRAINTS	PL:]nəma
☞a. sima]nəma			
b. sim]nəma	*!		
c. sima]a		*!	*
d. sima]Ø			*!
e. sima]si			*!

(71) Singular derivation

Base: sima]nəma Input: sima	FAITHIO	MARKEDNESS CONSTRAINTS	MORPHREAL
a. sima]nəma	*!***		
☞ b. sima]Ø			*
c. sim]ba	*!*		
d. sima]a	*!	*	
e. sima]lə	*!*		

The result in (70) shows that the ranking **PL:]*nəma*** is not crucial to the suffixation of the default plural morpheme. The fact that there is no derived form input means the form of the base does not undergo any phonological changes, (unlike nouns and adjectives in some of the other classes discussed so far), so no violations of highly ranked FAITHIO and other markedness constraints are incurred by (70b)

4.1.7 Suppletive Class

(72) Singular forms	Plural forms	
a. <kpee> /kpe-e/ [kpe:]	<taba> /tab-a/ [taba]	"colleague"
b. <goli> /gɔ-lə/ [gɔlə]	<chira> / tɕir-a/ [tɕira]	"month"
c. <kpaŋ> /kpaan-/ [kpaŋ:]	<kpini> / kpaan-/ [kpini]	"guinea fowl"
d. <wohu> /wor-/ [wohu]	<yuri> /wor-/ [juri]	"horse"

As noted before in Chapter 2, with illustration in (10), the singular and plural forms in the Suppletive Class still have stems and what look like number suffixes which are dropped in larger morphosyntactic contexts.

4.1.7.1 OT account

However, the lack of resemblance between the singular and plural forms in this class implies that FAITHIO is highest ranked. And since there are no unique singular and plural suffixes in this class, we do not need any class-specific fiat constraints. The contest is thus left essentially between the two faithfulness constraints, (73).

(73) Projecting plural forms from singular base.

Base: wor]PL Input: juri	FAITHIO	FAITHBA
☞ a. juri		*
b. wor]ba	*!	
c. wor]sə	*!	

(74) Projecting singular forms from plural base.

Base: tab]a Input: kpe:	FAITHIO	FAITHBA
a. tab]lə	*!	
b. tab]ə	*!	
☞ c. kpe:		*

4.2 Reduplication as a means of distributive plural marking

(75) Base forms — Reduplicated forms

a. <pirli> [pərlə] — <pirlipirli> [pərləpərlə] — "dividend/half"

b. <tarli> [tarlə] — <tarlitarli> [tarlətarlə] — "share/portion"

c. <piibu> [pi:bu] — <piibupiibu> [pi:bupi:bu] — "elections"

d. <tobu> [tɔbu] — <tobtobu> [tɔbtɔbu] — "wars"

e. <chergu> [tɕɛrgu] — <cherguchergu> [tɕɛrgutɕɛrgu] "bits"

f. <bela> [bɛla] — <belabela> [bɛlabɛla] — "small quantities"

4.2.1 OT account

As noted already, the total reduplication generally observed in this pattern reflects the high ranking of MAXBR. As my usual practice, I will replace this constraint with a more general base-reduplicant correspondence constraint, FAITHBR, that subsumes all faithfulness constraints between the base and reduplicant.

However, total reduplication is not universal to all nouns in this class since the base of some of the nouns, e.g. (75d), may not be the same as the input. (See 2.5 for discussion). This means we still need a distinction between base-reduplicant faithfulness and input-output faithfulness, with FAITHBA being the fall guy.

(76) Reduplicating for distributive plurality.

Base: tɔb Input: RED-tɔbu	FAITH IO	MARKEDNESS CONSTRAINTS	FAITH BR
a. tɔbu			**!
b. tɔbutɔbu			**!
☞ c. tɔb.tɔbu			*
d. tɔb.tɔb	*!		
Base: tɕergu Input: RED- tɕergu			
☞ e. tɕer.gu. tɕer.gu			
f. tɕerg.tɕer.gu		*!	*
g. tɕer.gu. tɕerg	*!	*	*
h. tɕer.tɕer.gu			*!*
i. tɕergu			*!****

In (76), the two faithfulness constraints are essential to determining the winning candidate due to the pattern of total reduplication. Total reduplication of the entire word in (76b) however implies vowel epenthesis, since the form of the stem (which is the base for total reduplication) is not the same as that of the entire word. This leads to more

violations of FAITH BR. Where these two forms are the same, deleting a segment in the base or reduplicant leads to the violation of either of the faithfulness constraints, as in (76f, g and h), and a possible occurrence of tautosyllabic consonant cluster.

4.3 Loanword integration

The patterning of loanwords in number inflection deserves brief comments. The discussion on the Default Class provides a partial explanation why loanwords are the most common category of nouns found in this class, which is, they (i.e. loanwords which are not yet fully integrated) are borrowed from other languages which do not have the stem-number suffix morphological structure of native nouns and adjectives, so they can not mark their singular and plural forms in the same concatenative process native words undergo since this process is conditioned by the morphology.

However, it still makes sense to see these loans as having undergone integration into the morphology of nominal inflection since the default plural suffix is not a loan. The strongest argument in favour of this position is the fact other native words receive this suffix, so loanwords with the default plural suffix have only integrated into an existing class of number suffixation in Dagbani. Thus the choice of the default plural suffix over the plural suffix that is native to that loanword (e.g. *–nama* for *buku* "book" (Eng.) in *bukunama* over *–s*) is only done with respect to the structure of the loanword, which resembles that of existing native words.

A much more obvious case of loanword integration is observed in loans that are suffixed with regular number suffixes, already shown earlier and repeated in (77). With the exception of (77c and h) which are integrated into the –a Class, all the loanwords

have been integrated into the –si Class. (Besides (77b, c and g) the rest of the data come from Olawsky 1999:93).

(77)	Singular forms	Plural forms	
a.	<bolli> /bɔl-lə/ [bɔllə]	<bolli> /bɔl-a/ [bɔla]	"(foot)ball" (Eng.)
b.	<belli> /bel-li/ [bʲelli]	<belli> /bel-a/ [bela]	"bell" (Eng.)
c.	<limam> /ləmam-Ø/ [ləmam]	<limam> /ləmam-a/ [limama]	"imam" (Ar.)
d.	<polinga> /polən-ga/ [poləŋga]	<polinga> /polən-si/ [poləns ə]	"police" (Eng.)
e.	<shikuru> /ʃikur-u/ [ʃikuru]	<shikurti> /ʃikur-tə/ [ʃikurtə]	"school" (Eng.)
f.	<kaa> /kaa-Ø/ [ka:]	<kahi> /kaa-si/ [kahə]	"car" (Eng.)
g.	<loo> /lo-o/ [lo:]	<lohi> /lɔ-hə/ [lɔhə]	"law" (Eng.)
h.	<soobuli> /so:bul-i/ [so:buli]	<soobuya> /so:bul-ja/ [so:buja]	"shovel" (Eng.)

In addition to the examples in (77), there are other loans whose number suffixation shows the same patterns as those observed in native words that have undergone phonological processes discussed earlier in this chapter. An example of this pattern is *l* deletion. (78) shows two loanwords which have plural suffixation displaying the same pattern observed in the nouns that undergo *l* deletion.

(78)	SG. forms	Plural forms	Similar-sounding native words	
a.	/loori-Ø/ [lo::ri]	/loori-/ [lɔra] (Eng.)	/go:n-li/ [go:n-i]	/gɔm-a/ "wall fence"
b.	/la:ndan-i/ [la:ndani] [la:ndana] (Hau.?)		/naŋgban-li/ [naŋgbani]	/naŋgban-a/ "mouth"

(The loan in (78a) means "lorry" and (78b) means "one who calls others to prayer").

The interesting thing about the pattern is that these loanwords cannot be said to have undergone the same change, yet they produce the same results. The results suggests that the realisation of the plural suffix *–a* is not conditioned by the underlying presence of *l* in this position, but by the stem-final coda sound common to all nouns in this subclass. This strengthens my claim of the uniqueness of the presence of a coda consonant in this class.

But the discussion on loanword integration presented so far seems to focus on how much we can learn about number marking of native nouns and adjectives by observing patterns of loan integration. Recall that in the discussion on debuccalisation, (77e) was used as evidence that the presence of [g] as onset of nouns and adjectives in the *–gu/–ga* Class has no effect on the plural allomorph that is suffixed to the stem. Similarly, the integration of (77d) can be used as a piece of evidence against holding singular forms as the underlying form from which plural forms are derived. What we have in this example is a noun that has been borrowed as a plural loan */polɔn-sɔ/* from which a singular form */polaŋ-ga/* that patterns like a lot of other native words (compare with */garaŋ-ga/* and *garɔn-sɔ* "serpent"), has been derived.

But the process by which loanwords get integrated has not been discussed (though see Hudu 2002 for a sketch on the phonology of English-Dagbani loanword integration). This aspect of the analysis, i.e. a formalisation of loan integration into the morphology of number marking is an interesting area that deserves attention in future research.

CHAPTER 5. FINAL DISCUSSION AND CONCLUSIONS

What I have attempted to do in this thesis is to give an OT account of number marking in Dagbani. The analysis does show that the OT framework has the mechanisms that have made it easy to achieve this goal. Firstly, by couching various aspects of the grammar of Dagbani in constraint and ranking them, number inflection has been contextualised within the entire grammar of the language and not a separate process with little or no interaction with the rest of the grammar. It has also made it easier to compare different forms of the singular and plural suffixes and to see these different forms as the natural output forms of constraint interaction thereby regularising a lot of what would otherwise be viewed as grammatically irregular forms.

An important aspect of the account presented here is the view that number inflection is not linear, so singular forms are not the underlying forms from which plural forms are predictable. Instead, I have shown how mutual predictability of one form from the other can be accounted for within the grammar of Dagbani.

Probably the most unique thing about the account here is the fact that all forms of number suffixation have been put into one class or another. Even the irregular ones receive a classification in the same manner as the regular ones. What is more, these classes are distinct from each other without any noun or adjective with a multiple class membership.

The distinction between loan and native words using number suffixation has also been neutralised in two ways. One, the default suffixation of *-nɔma* which has previously

been viewed as a pattern more peculiar with loanwords has been shown to be rather a more systematic part of the grammar of number marking affecting both loanwords and native ones in the same manner, and two, the form of a number suffix received by a loanword is governed by the same rules as those governing the suffixation of native ones.

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